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There are also three appendices, — the first relating to the reduction of the psychrometer observations, which, at the summit of the mountain, show certain considerable discordances; the second, on the experimental determination of wave-lengths in the invisible prismatic spectrum, — a paper already published elsewhere, but most appropriately reprinted in this connection; and, finally, an investigation of the effect of convection-currents upon the loss or gain of temperature by a thermometer-bulb.

There can be no question that Professor Langley's exposure of the fallacy of the earlier methods of investigating the solar radiation, and his invention of the spectrolometer, will always be recognized as an epoch in the history of the subject; and in the volume before us we have the best available summing-up of the matter.

It would be unjust to close this notice without an allusion to a fact which is well and gracefully stated in Gen. Hazen's brief preface: "It should be said that the aid given to Professor Langley [by the signal-service], which he so gracefully acknowledges in the text, was necessarily limited. A large part of the expense of the outfit was generously borne by a friend of the Allegheny observatory." To this anonymous friend, as well as to the signal-service and to Professor Langley himself, the thanks of all who are interested in science are due, and are hereby returned.

NOTES AND NEWS.

THE legislature of Wisconsin has appropriated a hundred and ninety thousand dollars to the University of Wisconsin, for rebuilding the science laboratories destroyed by fire on Dec. 1, 1884. The new buildings will consist of a chemical laboratory, a machine-shop, and a building for the departments of physics, engineering, geology, and zoölogy. All are to be fire-proof, or, more accurately, 'slow-burning,' buildings; and the heating-apparatus for all is to be placed in a separate structure. In addition to the above-named sum, the insurance on the former building, amounting to some forty thousand dollars, is appropriated for refitting the departments with necessary furniture and apparatus for immediate use. No appropriation for cabinets, etc., was urged, as the next legislature will meet before the completion of the new building. It is proposed to push the construction of the chemical laboratory and machine-shop as rapidly as possible. Since items have appeared, asserting that the Lapham herbarium was destroyed, it may be stated that the herbarium was not in Science hall, and is consequently intact.

— In their report on Edison's autographic telegraph, the examiners of telegraphic apparatus at the Phila-

delphia electrical exhibition write, "It was not set up in such manner that its construction or mode of operation could be examined, and we are therefore unable to report upon it. It may, perhaps, be proper to say that the autographic system for the transmission of communications in facsimile would seem to afford one of the most promising fields for the labors of future improvers of the telegraph. It is apparently in this direction, if any, that we must look for the future solution of the problem of cheap telegraphy. It will be readily understood that if an efficient system were invented by which the original message, as written by the sender, could be placed in a machine, and a facsimile of it instantly produced by the action of electricity at a distant station, and this by automatic machinery without the intervention of human hands, the actual cost of performing the service would be but the merest trifle. Yet there is apparently no obstacle in the way of obtaining this result, which we may not hope to see overcome sooner or later by the genius and perseverance of our inventors."

— The Leander McCormick observatory of the University of Virginia was inaugurated on April 13; the ceremonies taking place in the public hall of the institution, and Professor Asaph Hall of the naval observatory, Washington, delivering the address. The principal instrument is the great Clark refractor of twenty-six inches' aperture. The observatory has a house adjoining for the director, Professor Stone, and is possessed of a considerable endowment fund, the gift of Mr. W. H. Vanderbilt of New York.

— Capt. Thompson of the schooner R. Bowers reports that on June 4, 1884, in latitude 42° 46' north, longitude 60° 47' west, a sealed bottle, inside of which was placed a record of their voyage, was thrown overboard. The bottle, with record, was picked up on July 15, 1884, at Little Dover Bay, east point of Nova Scotia.

— A pamphlet has been issued by Dr. John S. Billings, the secretary-general of the International medical congress, to be held in Washington in 1887, giving the rules for the congress, and a provisional list of officers.

— The circular of the summer school of languages at Amherst for the coming session, exhibits an enlargement of the methods and aims of the school, and an increase in the number of subjects taught and of teachers demanded, which, a few years back, any one would have been thought over-sanguine to predict. The growth of the school seems to indicate plainly that it has created a demand for itself, and that its management is meeting the necessities of the case in a satisfactory manner. Professor Montague, of the department of modern languages in Amherst college, is the director of the school: and he has the immediate co-operation, in German, of Professor Zuellig, now an instructor at Princeton; in French, of Professor Bernard of Boston; in Latin, of Professor Johnson of Lehigh university; and in Hebrew, of the well-known specialist, Dr. Haley. Thirteen other instructors in language are also announced; and the generosity of the officers of the college in

making its cabinets, museums, and library collections available to the students of the summer school, is worthy of note.

—In commenting on the automatic chemical telegraph, the committee on telegraph apparatus at the Philadelphia exhibition says that this system was at one time in commercial use to a considerable extent in this country, but has been abandoned for reasons probably due more to peculiarities in the commercial requirements of American telegraphy than to any inherent difficulties in the operation of the mechanism itself. The automatic method of transmission, although full of promise, has in almost every instance failed to realize the expectations of its advocates as a substitute for the ordinary process of manual transmission. This difficulty, whatever it may be, is inherent in the principle itself, and is not properly chargeable to defects in the operation of the apparatus.

—The *Auk* for January contains the preliminary report of the committee on bird-migration, of the Ornithological union, from which it appears that observing-stations are now established in every state and territory in the Union, except Nevada. Returns have been received from over one thousand observers, who are usually, not ornithologists, but, as a rule, intelligent farmers, who know only the very commonest birds. The most eastern station is at St. John, Newfoundland; the most northern, at Belle Isle, off Labrador; and the most southern, at Sombrero Key, Fla. Reports have also come from many points on the Pacific, and even from as far north as Point Barrow, Alaska. The amount of information so far received is so comparatively meagre, that it is impossible to generalize as yet; but the various observers are working with great interest in the matter, so that it cannot be long before many valuable generalizations can be drawn from the data which are so rapidly coming in.

—The third lecture before the San Diego society of natural history was on the Sudan, delivered by Stuart Stanly; and the visit of Dr. Farlow was improved by engaging him to give the fourth.

—According to the Journal of the Iron and steel institute, large deposits of iron ore have been discovered in Cuba, the extent of which will cause the island to take rank with other countries as a source of supply of the raw material for iron-making. An American mining engineer states that he is familiar with most of the rich fields in the United States and in Europe, but that he has never seen any like those of Cuba. He adds that he has seen veins of iron ore, but that there are on the surface immense deposits, varying in thickness from ten to fifty yards, mostly in blocks of from two to twenty tons' weight. At one place he found by actual measurement that there must be present about 1,837,450,000 cubic yards of ore. This deposit is situated only about half a mile from the sea, where a good harbor can be opened to ship the ore. Farther in the interior there is another large deposit.

—The Royal society of New South Wales offers its

medal and twenty-five pounds for the best communication (provided it be of sufficient merit) containing the result of original research or observation upon each of the following subjects:—to be sent in not later than May 1, 1886, on the chemistry of the Australian gums and resins; on the tin deposits of New South Wales; on the iron-ore deposits of New South Wales; list of the marine fauna of Port Jackson, with descriptive notes as to habits, distribution, etc.: to be sent in not later than May 1, 1887, on the silver-ore deposits of New South Wales; origin and mode of occurrence of gold-bearing veins and of the associated minerals; influence of the Australian climate in producing modifications of diseases; on the Infusoria peculiar to Australia.

—The meteorological summary for February, 1885, at San Diego, Cal., gives the mean daily temperature at 55.9°; the highest temperature, 76°; the lowest temperature, 37.6°. The mean daily relative humidity was 77.7, with only .01 of an inch of precipitation, against 9.05 inches of precipitation in February, 1884.

—Rev. E. L. Greene, of the University of California at Berkeley, intends making a botanical trip in April to the Guadalupe and the Cerros Islands, off Lower California.

—The applications for space in the Inventions exhibition at South Kensington have been enormous. If all the applications had been granted, it would have required an area six times as large as Hyde Park to contain the exhibits; yet the inventions are confined to the last twenty-three years, and the music, with the exception of the historical collection, restricted to this century. Steam engines and boilers have the largest share of space; electricity, naval architecture, and mining and metallurgy, having the next.

—The total distance run by the cars on the Brighton (England) electric railway during the first six months of its existence was fifteen thousand six hundred miles. Two hundred thousand passengers were carried, at an expense of five cents per mile.

—It is reported that the experiment is to be tried in Berlin of running the street-cars by electricity. Storage-batteries of the form supplied by the Electric-power company of London will be employed.

—The Messrs. Orcutt of San Diego, Cal., intend penetrating the Lower Californian peninsula as far as possible by wagon this spring, with the object of investigating its flora.

—Mr. D. S. Smart, in a paper recently presented to the British institution of civil engineers, describes recent British practice in steam-boiler construction. He states that 'low,' 'soft,' or 'mild' steel, which has the valuable qualities of iron without its defects, is now extensively used for this work. It is made usually from thirty to thirty-six per cent stronger than boiler-iron, and is superior, when well made, in ductility. Some variation in this last respect has led to considerable distrust of the metal; but this distrust has been quite often due to unfamiliarity, on the part of users, with the nature of the material, and

with the proper methods of manipulating it. Some brands are found to weld like iron, while others will not weld, and are brittle. No accident of serious character has yet occurred, however, to any steel boiler, so far as reported. It is not yet fully ascertained to what extent deterioration may affect the safety of steel boilers. It is anticipated, however, that the metal is likely to prove more satisfactory in this respect than iron. Steel rivets are used to some extent, and their use is continually increasing. More care is requisite in their working than is demanded in the use of iron rivets. It is desirable that all parts of the boiler, and, as far as possible, of its appurtenances, should be made of steel, in order that voltaic action and consequent corrosion may be avoided. Steel plates are usually drilled, instead of being punched, as it is found that steel is more liable to injury by punching than iron.

—The seventh volume of the *Bulletin* of the National academy of sciences, of Cordoba, is entirely occupied with a monograph on Staphylinidae, or rove-beetles, of Buenos Ayres, by Arribáizaga, which is completed with the third number, just received, making altogether nearly four hundred pages.

—The Portuguese explorer, Serpa Pinto, has undertaken a fresh expedition into central Africa. He intends to start from Mozambique in the direction of Lake Tanganyika, crossing the Muropue country, where he hopes to meet with the Portuguese Kongo expedition.

—A French commission has left Marseilles to further the Roubaire scheme of an inland sea in the African desert. The destination of the commission is Gabes, where a harbor is to be made as an outlet for the connecting canal.

—Town councillor Helm of Dantzic has given his collection of three thousand specimens of amber insects, and seven thousand beetles, to the West-Prussian provincial museum, on condition that they are left in his own house during his lifetime.

—The British steamship *Chicago*, Capt. Jones, reports that on March 25, in $41^{\circ} 14'$ north, $62^{\circ} 10'$ west, at two P.M., a very heavy vapor was observed on the surface of the sea; and distributed about in this vapor were hundreds of miniature water-spouts, rising about twenty feet high. Immediately over this part of the water was a large, black, arched cloud. The barometer at the time was 30.09, air 48° , water 61° ; winds moderate from the southward.

—In the April number of the *American journal of mathematics*, the contributors, seven in all, hail, two from Baltimore, and one each from Paris, the Royal academy at Woolwich, Toronto, Bremen, and Porto.

—Among recent deaths we note the following: Major F. J. Sidney Parry, one of the oldest members of the Entomological society of London, in The Warren, Bushey Heath, Feb. 1; J. A. Serret, mathematician, at Paris, March 3; Nicolas Sewertzow, zoölogist, Feb. 9; Gen. G. von Helmersen, geologist, member of the Royal academy of sciences since 1844, at St. Petersburg, in his eighty-third year; Geoffrey

Nevill, formerly assistant superintendent of the Indian museum at Calcutta, at Davos, Feb. 10; Dr. Ernst Erhard Schmid, professor of mineralogy in the university of Jena, at Jena, Feb. 16, in his seventy-first year; Carl Theodore Ernst von Siebold, professor of zoölogy in the university of Munich, at the age of eighty.

—At a meeting of the Society of chemical industry, held in Glasgow on March 3, Mr. James Murrie read a paper on the processes employed in Italy for the extraction of oils, etc., from bituminous rocks in that country. At the outset he said that the Italian government had given great facilities for developing the internal resources of the country, particularly with regard to carbonaceous deposits. There was a general belief that a belt of oil passed through the Apennines in the direction of Roumania, and curved out near Bucharest. There was, however, really no such thing as an oil-belt in Italy. The deposit of oil and bituminous rocks, which had received the greatest attention, was situated in a spur of the Apennines known as the Abruzzo, in the province of Chieti, twenty miles inland from the town of Pescara, on the Adriatic. The indications of bitumen occurred in the form of asphaltic rock, found in a superficial deposit on the slope of the mountain. Going on to speak of the extraction and manufacture of oil from the rock, Mr. Murrie remarked that about twenty companies had started operations for the purpose of utilizing this mineral. These ventures had invariably turned out failures; the cost of refining it being too high, and the density of the oil produced too great, to allow of its being used for burning-purposes. So far as his observation went, the only uses it could be put to were in street-lighting, for mining-purposes, and in the preparation of lubricating-oils.

—In addition to the numerous uses to which the wonderful network of Parisian sewers has already been put, we learn from *La lumière électrique* that the lines of telephone-wires are now being placed upon these underground walls. This is simply following the example of the telegraph companies, who did the same in 1880. The sewers also contain two large water-pipes, — one for household, the other for sprinkling purposes; and, besides, a pneumatic tube used for the transmission of messages, and a smaller pipe which transmits the air-pressure for the system of pneumatic clocks distributed throughout Paris.

—Mr. E. E. H. Francis recently read a paper at the London chemical society in which he showed that filter-paper, ordinarily so weak, can be rendered tough, and at the same time pervious to liquids, by immersing it in nitric acid of relative density 1.42, then washing it in water. The product is different from parchment paper made with sulphuric acid, and it can be washed and rubbed like a piece of linen. It contracts in size under the treatment, and undergoes a slight decrease of weight; the nitrogen being removed, and the ash diminished.

—The king of the Belgians has planned an International geographical society, and has summoned Milne-Edwards of Paris to be his helper therein.

— According to the committee on telegraph apparatus at the Philadelphia electrical exhibition, the possibility of employing a single conductor for the simultaneous transmission of two or more sets of telegraphic signals appears to have originated with Moses G. Farmer of Boston, Mass., about the year 1852. Mr. Farmer attached to each end of the line a rapidly revolving commutator or distributor. The two distributors, when caused to revolve synchronously and in unison, served to bring the line successively and simultaneously into connection with a corresponding series of short branches at each terminus, in each of which branches ordinary telegraphic apparatus was inserted and operated in the usual manner. Thus the current through each pair of corresponding branches at either station, while apparently continuous, actually consisted of intermittent but rapidly recurring synchronous pulsations. Mr. Farmer successfully experimented, upon a small scale, upon the wires of the municipal telegraphic lines of Boston in 1852. Nothing of permanent value, however, resulted from the experiments at that date, the difficulty of maintaining the absolute synchronism required for operating for any considerable length of time being apparently insuperable.

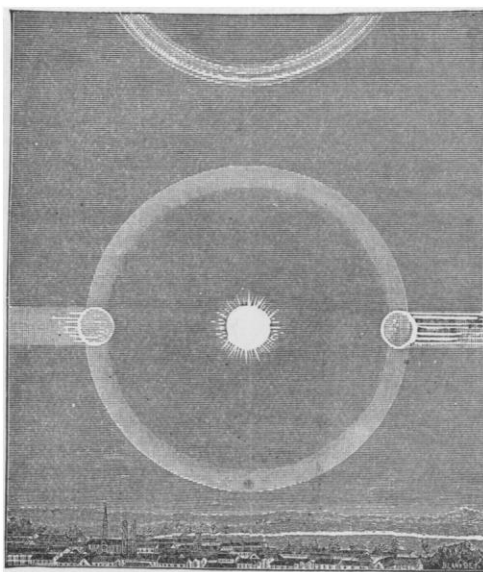
— *L'Astronomie* reports a most remarkable halo seen by M. D. Luzet on the 17th of January last at Orleans, France. There were no clouds in the sky, simply a light mist, and the temperature was -1° C. At 12.40 P.M. a very brilliant circle, with a radius of 22° , appeared around the sun; and, at the two extremities of the horizontal diameter of this circle, two white spots were formed, which, gradually increasing in intensity, became very brilliant at 12.55. Above, and not touching the circle, was a rainbow, which gradually faded out at its extremities into the blue sky. The red of this bow was outside, the violet within, and the brightness and distinctness of the tints were very marked.

— The recent fire in the capitol at Trenton, N.J., inflicted considerable loss on the geological collections of the state. The suites of typical rocks from the several formations, and large collections of iron ores, clays, marls, and soils, were all lost; and some old state maps, now out of print, were destroyed. The old collection of H. D. Rogers was lost; that of Dr. Kitchell was saved. Fortunately, a large number of selected representative specimens of rocks, ores, woods, etc., escaped by being in the state exhibit

now at New Orleans; and while the loss, as a whole, is a serious one, it is not irreparable. In the continued prosecution of the state survey, it will be possible in time to make a fuller and more representative collection than that which is destroyed. It is to be hoped that the new rooms, which we understand are to be provided for the museum, will be of safer construction, and, if necessary, isolated to make them more secure.

— The *Echo du Japon* reports the arrival in Japan, at the beginning of the year, of Joseph Martin, a French traveller, who had just been exploring the parts of Siberia hitherto very little known. His principal journey was from the Lena to the Amoor, across the Stanowai chain of mountains. During his explorations he was able to make geographical and geological collections, which are intended for the Paris museums. In consequence of hardships endured on the journey, two of his native followers died, and one lost his reason.

— Mr. Ellery of the Melbourne observatory has taken the necessary steps toward the organization of a small expedition to the southern coast of the north island of New Zealand, in the coming September, to observe the total eclipse of the sun, which occurs on the 8th of that month. The track of the line of total eclipse lies almost wholly in the South Pacific Ocean, and New Zealand is the only land crossed by it; the duration of totality lasting about two



HALO SEEN AT ORLEANS, FRANCE.

minutes at the spot most favorably located for the observation.

— The legislature of New York has passed an appropriation of twenty-five thousand dollars for the State survey.

— A bill has passed the Wisconsin legislature providing for the education of deaf-mutes. Hitherto there has been no special provision for their instruction.

— The topographical map of New Jersey, to which attention has been called already several times, has now advanced to the point of issuing six sheets in all. They are fine pieces of work, of which the state may justly be proud. Eleven more sheets remain to be done.

— We neglected to state in our last that the facsimile of the map by General Gordon, of the route from Suakin to Berber, was published by Edward Stanford, 55 Charing Cross, London.